PREPARATION AND CHARACTERIZATION STM PLATINUM PARTICLES AT ELECTROCHEMICALLY MODIFIED CARBON ELECTRODES.

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Carbon (eg. glassy carbon) electrodes have been recently functionalized with 4-substituted phenyl groups by electrochemical reduction of the corresponding phenyl diazonium tetrafluoroborate salt dissolved with an appropriate electrolyte in acetonitrile (1, 2). More recently, we have shown that carboxy phenyl functionalized carbon electrodes would be suitable for recovery of metallic ions present in an aqueous solution (3). As a natural extension of this work, we have decided to generate metal particles at 4-substituted phenyl modified carbon electrode with the goal of generating novel electrocatalytic electrode material (4, 5).

For catalytic and electrocatalytic purposes, noble metal particles dispersed on a substrate such as carbon has recently become a very important issue. Many procedures reported lately focus on homogeneous size distributions of nanoparticles of metals such as platinum, palladium and gold. It has also been pointed out that the size of the nanoparticles is an important factor to be considered in model electrocatalytic reactions involving the oxidation of organic fuels such as formic acid or methanol.

The present work focuses on dispersing metal particles onto chemically modified carbon electrodes. The strategy is to use electrostatic interactions to capture specific metal complexes at the carbon surface and thereafter to reduce the trapped species to the metallic state. In order to favour the electrostatic interaction, the carbon surface was activated by grafting a film of N,N-diethylaniline to the surface, by reducing a diazonium salt (4-diazo-N,N-diethylaniline fluoroborate) in an acetonitrile solution. Free aryl radicals strongly react with the carbon surface and attach to the surface through a covalent bond. This may lead to the formation of close packed monolayers of diethylaniline groups. However, the radical mechanism can yield secondary reactions as already pointed out previously. A three-dimensional growth of polymer structures consisting of aniline groups linked to one another can then take place (5).

In acidic medium, the diethylaniline groups are positively charged and can thus interact with negatively charged complexes present in solution. This work is aimed at using the aforementioned procedures to obtain crystallites of various metals such as platinum. The particles are probed by surface sensitive techniques like AES or XPS as well as scanning probe microscopy techniques (AFM and STM). The activity of the modified carbon electrode is evaluated by resorting to model electrocatalytic reactions.

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